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ABSTRACT

This module on the reproductive system is one of 17 modules designed for individualized instruction in health occupations education programs at both the secondary and postsecondary levels. It is part of an eight-unit miniseries on anatomy and physiology within the series of 17 modules. Following a preface which explains to the student how to use the module, the unit consists of a pretest with answers, four sections (information sheets) with their objectives (e.g., identify and describe the processes involved in conception), optional activities (e.g., describe what would be necessary to produce a "test-tube baby" from conception through the ability to survive on its own), and posttests, and a glossary of terms. Topics covered in the unit are introduction to the reproductive system, the female reproductive organs, the menstrual cycle, and conception. An accompanying instructor's guide contains suggestions for using the module and answers to the posttest. (KC)

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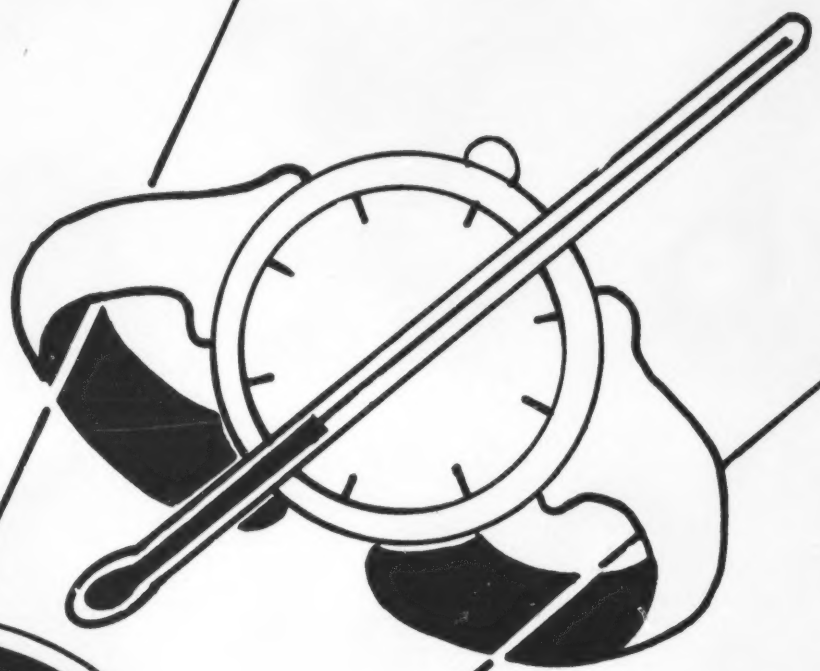
# HEALTH OCCUPATIONS EDUCATION MODULE



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## THE REPRODUCTIVE SYSTEM

Instructional Materials in Anatomy and Physiology
for Pennsylvania Health Occupations Programs

# THE REPRODUCTIVE SYSTEM

Prepared for:

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June, 1980

# PREFACE

An understanding of basic human anatomy and physiology is essential to any person preparing to enter a health occupation. This instructional unit is designed to introduce you to the structures and functions of the human reproductive system--and the interrelationships of the two--and to familiarize you with some of the terms and concepts necessary for an understanding of the reproductive system.

This unit consists of a pretest, four modules with their optional activities, a glossary of terms, and a post-test.

Begin this modular unit by taking the brief pretest at the front of the booklet. Write your answers on a sheet of paper and pass it in to your instructor.

Next, read through each of the modules (Introduction to the Reproductive System, The Female Reproductive Organs, The Menstrual Cycle, and Conception) and investigate any of the optional activities that may be helpful or interesting to you. The optional activities will help you learn more about some of the materials presented.

At the end of this unit is a glossary which provides you with brief definitions of many of the terms used in the modules.

Upon completion of this unit, you should be able to demonstrate an understanding of the material presented by your performance on the post-test. When you have finished this unit, and feel that you understand the information presented, take the post-test that follows. Write down your answers on a sheet of paper and pass it in to your instructor, who will give you your grade.

The Reproductive System
PRETEST

1. The primary female reproductive organs, or gonads, are the:

_____.

2. Which of the following is the primary function of the reproductive system?

A. synthesis of hormones
B. perpetuation of the species
C. maintenance of homeostasis
D. production of enzymes

3. The pear-shaped organ of the female reproductive system is the:

A. uterine tube.
B. vagina.
C. uterus.
D. cervix.

4. In what process is a mature ovum released from a ruptured ovarian follicle?

_____

5. Which organs of the female reproductive system produce and store milk?

_____

6. A female's first menstrual cycle is called:

   A. ovulation.
   B. menopause.
   C. conception.
   D. menarche.

7. Fertilization is the result of combining a male sperm cell with a female:

   _____.

8. The structure through which the developing fetus receives nourishment from the mother is the:

   A. uterine tube.
   B. vagina.
   C. umbilical cord.
   D. cervix.

9. The female menstrual cycle is controlled primarily by:

   A. hormones.
   B. enzymes.
   C. lipids.
   D. electrolytes.

10. Name the three structural divisions of the uterus.

    _____

    _____

    _____

11. List the three layers of the uterine wall.

_____

_____

_____

12. The years in which a woman menstruates signifies the years she is able to:

A. conceive children.
B. create ova.
C. produce hormones.
D. undergo puberty.

13. Fertilization normally occurs in what organ?

_____

14. Name the two female hormones that are primarily responsible for the changes of puberty.

_____

_____

15. Most of the female reproductive organs are located within the:

A. uterus.
B. abdomen.
C. ovaries.
D. chest.

# INTRODUCTION TO THE REPRODUCTIVE SYSTEM

## Objectives

Upon completion of this module, you should be able to:

1. Describe the general organization of the male and female reproductive systems.
2. Describe the functions and characteristics of the male and female reproductive systems.

Every anatomical system within an individual's body--except one--functions to keep the individual alive and healthy. The reproductive system is the notable exception to this rule. An individual does not need the reproductive system to survive; however, the species does. The reproductive system is the set of organs that brings about new individuals and perpetuates the species.

Reproduction--the process of creating and bringing new individuals into the world--is a joint effort between male and female. Each donates a reproductive cell to the process. These cells contain the genetic material that, when combined, will produce an entirely new individual. The male reproductive system furnishes a sperm cell and the female reproductive system furnishes an ovum or egg cell. Both are necessary for conception to occur and for the new life to begin.

The male's role in reproduction is to donate the sperm. Fertilization--the uniting of the cells--occurs within the reproductive system of the female's body, and development of the new individual continues there. For this reason, the characteristics of the male and female reproductive systems are slightly different. The male's system must be structured to introduce the sperm into the female. Therefore, the primary male reproductive organs, the testes and the penis, are external, whereas the accessory glands and the ducts are enclosed within the body.

The female reproductive system has a more complex role in reproduction. It must produce the ovum; receive the sperm; provide anchorage, protection, and nourishment for the developing fetus; give birth to the new child; and often provide nourishment for the child after birth. For the purpose of fulfilling all these functions, the female reproductive system is mostly internal: most of the organs that make up the system are enclosed within the abdomen. Here, nourishment and protection can best be provided to the developing baby. The only external organs are those that initially receive the male's sperm, and the organs that nourish the infant after birth.

The structures of the male reproductive system share those of the male genitourinary system. Therefore, both systems are discussed in the unit covering the genitourinary system. This unit will discuss the female reproductive system and the male's role as it contributes to reproduction.

# THE FEMALE REPRODUCTIVE ORGANS

## Objectives

Upon completion of this module, you should be able to:

1. Identify and describe the location, structure, and functions of the ovaries.
2. Identify and describe the location, structures, and functions of the uterus and uterine (fallopian) tubes.
3. Describe the location, structures, and functions of the vagina, external female genitalia, and the mammary glands.

The primary female reproductive organs, or the female gonads, are the ovaries. The rest of the reproductive system supports and serves the functions of the ovaries. The uterine or fallopian tubes provide ducts from the ovaries to the uterus, and the vagina and external genitalia provide a passageway from the uterus to the exterior.

From the front, the female reproductive system resembles the letter T; the ovaries are positioned at the ends of, and slightly below, the crossbar, at about the level of the crests of the pelvis. The internal reproductive system extends down the pelvic cavity between and beneath the ovaries. (See Figure 1.)

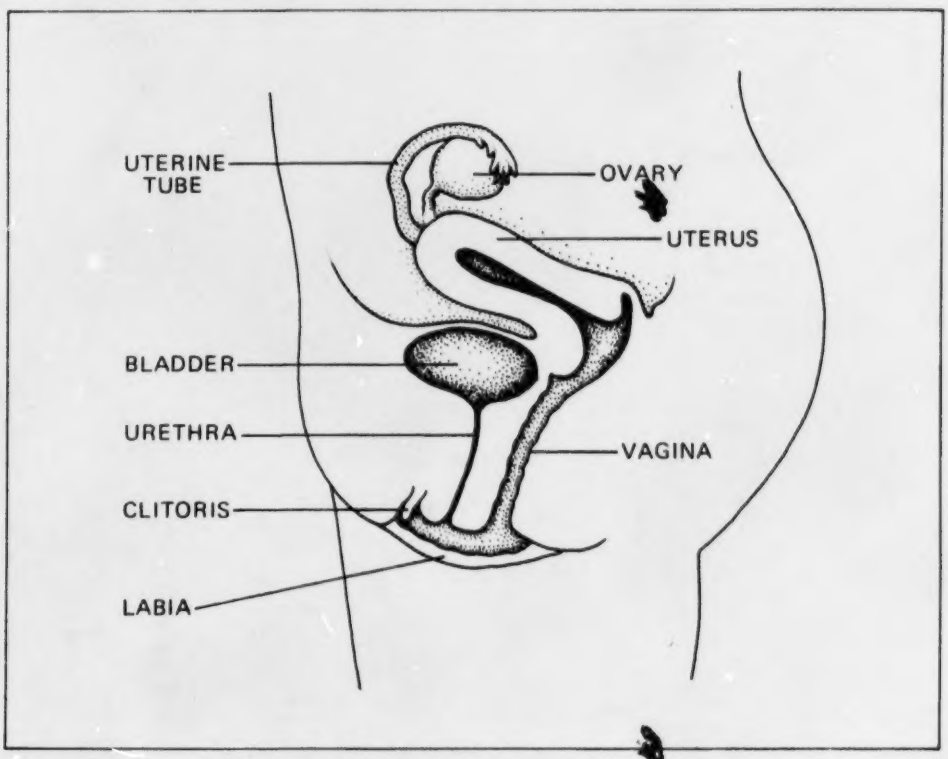



**Figure 1.** The Female Reproductive Organs

The ovaries are often compared to almonds in shape, although they are slightly larger. Within each ovary are thousands of ova in various stages of development (one of which is called an ovum). The ova, or eggs, are the female reproductive cells. They are stored in ovarian follicles, which rest in a web of connective tissue inside each ovary. Each ovarian follicle consists of an ovum enclosed in a globe of cells. While in this follicle state, the ova are immature--that is, they are not capable of serving as reproductive cells.

Oogenesis is the primary function of the ovaries. This is the process of forming mature ova from the ovarian follicles. The mature ova are released from the follicles by a process called ovulation, the second function of the ovaries.

The third ovarian function is to produce and secrete hormones. In their role as endocrine glands (producers of hormones), the ovaries exert an influence on the entire female body. The female hormones bring about the development of reproductive maturity; they also trigger the various stages of the recurring menstrual cycle. The secretion of the hormone estrogen causes growth in certain areas of the body; development of the secondary sex characteristics, such as prominent breasts, wider hips, and changes in the external genitalia, depends on estrogen. Estrogen is also important in the menstrual cycle and in pregnancy. The hormone progesterone helps the reproductive system to fulfill the supportive functions of reproduction; for instance, progesterone prepares the body for the task of nourishing the embryo before birth and the breasts for nourishing the infant after birth.

The uterine tubes--also called the fallopian tubes or oviducts--serve as passageways from the ovaries to the uterus. These thin tubes form the crossbar of the reproductive T mentioned earlier. Each tube opens into the abdominal cavity near an ovary at one end, and into the uterus at the other end. The tube-ends near the ovaries are funnel shaped and have fringed, finger-like structures called fimbriae reaching out toward the ovaries. Inside each funnel, and continuing down the length of each tube, are tiny hairs called cilia. The cilia are always waving towards the uterus. This constant motion (ciliary action) helps the uterine tubes to fulfill their functions, to serve as the site of fertilization, and to conduct the ova to the uterus.

The next organ in the system, the uterus, is found at the intersection of the imaginary T, where it rests behind the pubic bone just above the bladder. Its shape is often compared to that of a pear, although the pear it resembles is fairly small, thin, hollow, upside-down, and tipped forward. The uterus has three structural divisions or areas. The top of the uterus is called the fundus. This area curves slightly forward above the junction of the uterine tubes with the uterus. The fundus wall is very thick. Below the fundus is the body, which is the largest portion of the uterus. The uterine cavity lies within the body of the uterus and extends as a narrow canal through the cervix. The cervix (or neck) is the narrowest part of the uterus, with the thinnest wall.

The uterine wall is made up of three layers. On the outside is the perimetrium, a tough layer that partially covers and protects the uterus. The myometrium is the middle and thickest layer, since it is composed entirely of very strong, elastic, smooth muscle. This muscle is thin at the cervix, but very thick at the fundus. It

makes the uterus an extremely strong organ, which is important to its function. The innermost layer is the uterine lining or the endometrium. This thin layer consists of mucous membrane, richly supplied with blood vessels.

The different aspects of uterine structure are vital to its function. The uterus is the organ in which the fertilized reproductive cell develops into an embryo and then into a fetus. It provides the site for implantation of the embryo within the endometrium (which also furnishes nourishment for the very early stages of embryonic growth). The rich blood supply of the uterus also supplies the placenta, an organ which provides nourishment to the fetus in later stages of development. The muscular myometrium protects the developing fetus from injury, and at birth, these same muscular walls squeeze or push the fetus out of the uterus. The thick muscle of the fundus pushes down and the thin cervical muscle gets thinner. The cervical canal widens, and the uterus expels the infant. The placenta, having no further use, is also expelled by the uterus. This expulsion of the placenta is often called the afterbirth.

The vagina is the upright bar of the reproductive T. It extends from the cervix downward and forward to an outside opening in the pelvic floor. The vagina lies behind the bladder and the urethra, and in front of the rectum. The vaginal opening is between the urethral opening and the anus. Like the uterus, the vagina is made of smooth muscle with a mucous lining. It is a very elastic tube about four inches long; the cervix bulges out into its upper end. The tube-like structure and the elasticity are necessary to two of the vagina's functions. It is the organ that receives the penis during copulation, and into which the male reproductive cells (the sperm) are deposited; and the organ through which the infant emerges at birth. The vagina also serves as the outlet for any other uterine products, such as the menstrual flow. The vagina may be wholly or partially blocked by a thin, membranous fold called the hymen.

The external genitalia surround the vaginal opening. The female genitalia are also collectively called the vulva. The mons pubis is the uppermost structure of the vulva. This is a thin mound of fatty flesh lying over the pubic bone and covered with pubic hair. The labia majora (labia means "lips") extend below the mons, reaching around the vaginal opening and towards the anus. They are fatty protective folds of flesh enclosing the labia minora. These smaller labia are thin skin-folds which are extremely elastic (a property necessary for the act of giving birth). Bartholin's glands, or the greater vestibular glands, lie within the labia minora on either side of the vagina. They empty lubricating mucus into the vagina when necessary, as during copulation. Within the upper junction of the folds of the labia minora is the clitoris. This is a small piece of highly sensitive erectile tissue embryologically similiar to the penis. Below the clitoris are the urethral and vaginal openings. (These are only visible when the labia are opened.) The perineum lies between the vaginal opening and the anus. The perineum is a set of strong muscles that supports the pelvic floor.

The mammary glands or breasts are modified sweat glands that are accessory organs to the female reproductive system. They produce milk for nourishing the newborn. They are located on the chest, where they are held to the pectoral (chest)

muscles by strong connective tissue. The mammary glands are made up mostly of connective tissue and fat deposits. Within the connective tissue are lobes which store and secrete milk. These lobes drain into a series of ducts which join together near the areolae, darkly pigmented areas surrounding the nipples. The ducts open in several places on each nipple. Lactation, the process of secreting milk from the breasts, is controlled by hormones.

## OPTIONAL ACTIVITIES

- View a film on the female reproductive system.
- Research the process of lactation. How is human milk suited to the growing infant's needs?
- Trace the path of an ovum from the ovaries to the vagina.

# THE MENSTRUAL CYCLE

## Objectives

Upon completion of this module, you should be able to identify and describe the processes and stages of the menstrual cycle.

The menstrual cycle is an important process of the female reproductive system. The years in which a female menstruates are the years when she is able to reproduce. Before the onset of the menstrual cycle and after its cessation, a woman is usually incapable of conceiving or bearing a child.

Menarche is the term for the first menstrual cycle which signals the onset of the childbearing years. It occurs around age ten to age fourteen, usually at the same time as puberty, the time at which the girl begins assuming the shape of a woman; pubic hair grows, the hips widen, and the breasts begin to develop. Other changes are not so obvious, but are occurring as the body prepares itself for its reproductive tasks.

A female child is born with all her potential ova (estimated at 400,000 cells) already formed in the ovaries. Some 30 to 40 years after the menarche, the menstrual cycle stops. The event is called menopause. Several physical changes occur at menopause, but its most important aspect is that because ovulation ceases, the woman can no longer have children.

Each menstrual cycle occurs over a period of approximately 28 days, although this can vary tremendously from woman to woman. Hormones control the complicated series of interrelated processes. The cycle begins with the follicle stage. A pituitary hormone called follicle-stimulating hormone, or FSH, becomes active toward the end of the preceding cycle. FSH stimulates several of the primordial (undeveloped) ovarian follicles in one ovary to begin developing. Which ovary is stimulated is apparently a random choice. The developing follicles grow and mature to become graafian follicles. This occurs usually 10 to 12 days after the end of the preceding cycle. At the same time, the enlarging follicles release the hormone estrogen into the body. The estrogen causes changes in the uterus: the thin endometrium begins to thicken as gland cells and blood vessels begin to develop in its layers. By the end of its development, the endometrium is three times as thick as normal.

Meanwhile, the follicles within the ovary continue to grow. When they have reached their maximum growth, one of them ruptures. A mature ovum is released from the ruptured follicle; the other developing follicles are reabsorbed by the ovary,

so that only one ovum is released per cycle. The exceptions to this rule often result in multiple births. The mature ovum, now free in the abdomen, is normally drawn by the fimbriae into the open end of the nearby uterine tube. Ciliary action propels the ovum in a slow migration down the uterine tube toward the uterus. This journey usually takes three to seven days.

Ovulation is the term for the release of the ovum from the follicle. The ovulation stage of the menstrual cycle occurs at varying times after the end of the preceding cycle. However, this stage usually takes place 14 days before the next menses, or menstrual flow. Several physical changes mark the ovulation stage. The most obvious are a sudden rise in body temperature and an increase in mucous production in the uterus. Both of these changes are part of the reproductive system's preparation for the fulfillment of its task, the nurturing of a fertilized ovum.

The corpus luteum stage follows the ovulation stage. The migrating ovum has left behind a ruptured follicle whose cells again enlarge and produce a yellow fatty material which gives the entire follicle a yellow appearance. This changed follicle is called the corpus luteum or "yellow body." The corpus luteum secretes the hormone progesterone, starting almost with the release of its ovum and continuing for the 10 to 14 days of its existence. Progesterone acts on the growing endometrium of the uterus: it increases the endometrium's blood supply and further develops its nutrient capabilities. In this way, the reproductive system is prepared to sustain a fertilized ovum.

If the migrating ovum does not become fertilized, the menstrual flow stage of the cycle begins. The corpus luteum shrinks and withers. The levels of progesterone and estrogen decrease with the disappearance of the corpus luteum. These hormones maintain the development of the endometrium, so when their production stops, the endometrial growth stops and the developing tissue dies. This tissue then breaks down and slowly pulls away from the uterine wall. As it pulls away, a little bleeding occurs from the raw areas of the wall. The dead uterine lining, the nutritive mucus, and the seeping blood all gravitate to the bottom of the uterine cavity. From there, they slowly ooze out through the cervical canal. This gradual flow is called menstruation and marks the end of the menstrual cycle. It lasts from three to five days.

Now the reproductive system is ready once again to prepare itself for the possibility of reproduction. As the menstrual flow starts, FSH is released into the system to stimulate the ripening of a new follicle. The cycle begins once again to serve its function: to prepare the endometrium of the uterus for the possibility of a fertilized ovum needing implantation and nourishment. Figure 2 charts the different stages of the menstrual cycle.

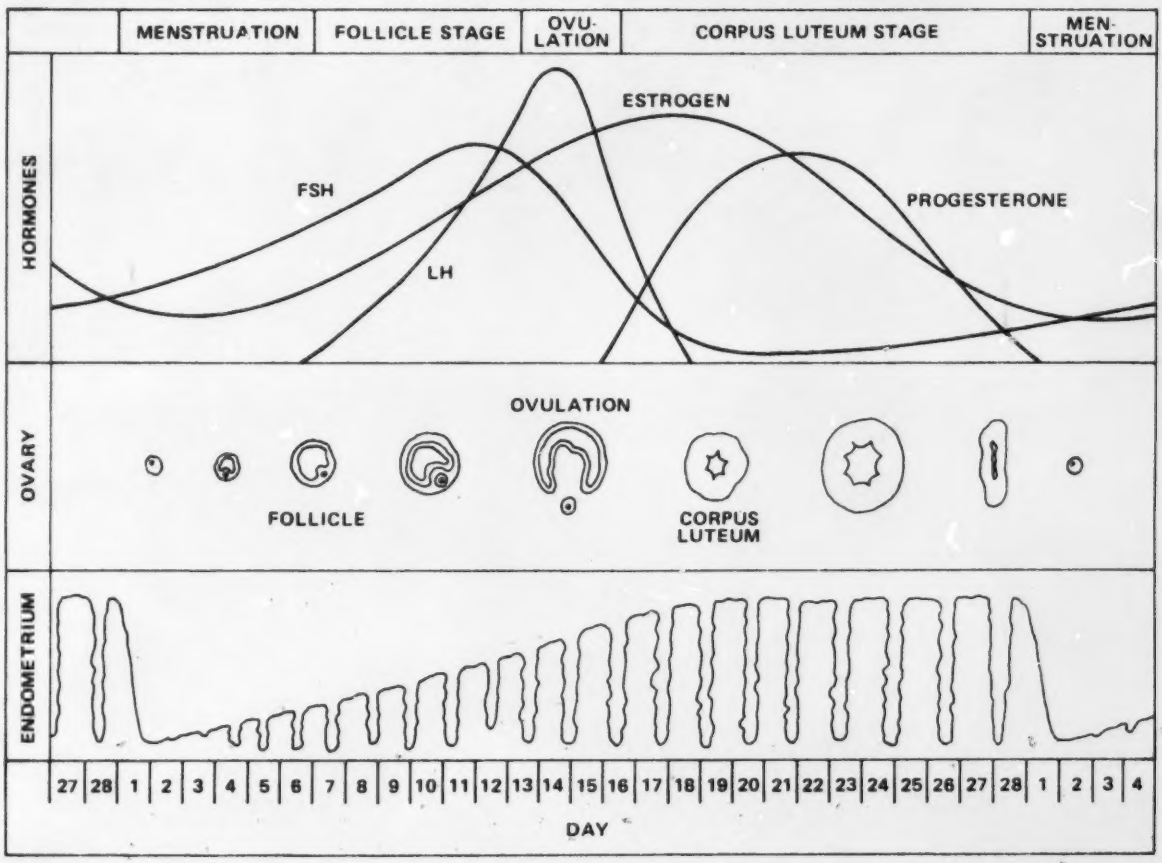



**Figure 2.** The Menstrual Cycle

## OPTIONAL ACTIVITIES

- Find out how the contraceptive pill works. How does this relate to hormonal mechanisms?
- Describe the various bodily changes that occur at puberty. How do these contribute to the function of the reproductive system?
- Investigate the rhythm method of contraception. How does this relate to changes in uterine temperature?

# CONCEPTION

## Objectives

Upon completion of this module, you should be able to identify and describe the processes involved in conception (copulation, fertilization, and implantation).

The menstrual cycle prepares the body to support a developing new life. Menstrual flow usually occurs only if conception does not. Conception is the very beginning of a new organism; it is the union of the female reproductive cell (the ovum) with the male reproductive cell (the sperm) to produce a genetically-new individual cell. This cell will develop through various stages and eventually become the embryo.

Normally, copulation is required for conception to occur. Copulation, or the sex act, is the process by which sperm is introduced into the female reproductive system. The male's penis is inserted into the female's vagina. Through the process of ejaculation, the penis propels seminal fluid into the vagina. The seminal fluid contains the sperm cells. If copulation occurs at the right time in the female's menstrual cycle, fertilization may occur.

Fertilization is the union of a sperm cell with a mature ovum. The ovum travels through the female reproductive system only once a month and then only for a brief while, so timing is a factor in fertilization. The sperm cells can live within the female reproductive system for 24 to 48 hours after ejaculation. The ovum dies within 8 to 24 hours after its release from the follicle. For fertilization to occur, copulation and the deposition of viable sperm, must take place just before or just after ovulation--within the respective life spans of the reproductive cells.

Conception occurs with the penetration of the ovum by a sperm cell. Once in the female reproductive system, the sperm cells propel themselves toward the uterine tubes. The ovum is released into the tube and migrates downward very slowly, so fertilization necessarily occurs in the uterine tube. The sperm cells reach the fallopian tube within 40 minutes after their entry into the female body. It is believed that many sperm must be present to stimulate the ovum to accept a sperm cell; however, only one sperm cell actually penetrates the egg. This ensures that the resulting cell, which is the product of the union of male and female reproductive cells, will have the proper amount of genetic material and no more.

The newly fertilized cell, called a zygote, continues on its slow journey through the uterine tube toward the uterus. The zygote has a reservoir of nourishment from the ovum and may also be nourished by substances released from the uterine tube lining. This nourishment is necessary because the fertilized cell is now beginning to develop at a rapid rate. About 30 hours after fertilization, the cell divides. It continues to divide every 10 hours or so.

This growing organism, now called a blastocyst, reaches the uterus several days after fertilization. By this time it resembles a microscopic blackberry; it is a hollow cluster of rapidly dividing cells. Upon reaching the uterus, the blastocyst attaches itself to the thickened tissue of the endometrium. In a process called implantation, the outside cells of the cluster literally eat their way into the endometrial lining. The inside cells of the cluster continue to divide and differentiate. They will become the embryo; this tiny organism will slowly develop human features within the nourishing protection of the uterus.

The attaching cells do not become inactive, however. They too continue to develop and differentiate. As the embryo grows larger the endometrial tissues become incapable of supplying enough nourishment. The placenta develops from the attaching cells to meet the embryo's increasing needs. This organ attaches to the mother by the uterine wall and to the fetus by a structure called the umbilical cord. The cord contains blood vessels from both the mother and fetus. Within the placenta, a rich supply of oxygen and nutrients diffuses from the mother's blood into the fetus's blood. (The two blood systems are separate, however, and the bloods do not mix.) It is not long before the developing placenta is capable of fulfilling its functions: to produce and secrete hormones, and to provide the means by which the female body can nourish and sustain the new life it has helped generate.

## OPTIONAL ACTIVITIES

- Watch a film on childbirth. Note the role played by the uterus in birthing the baby; the changes in the external genitalia; and the delivery of the placenta.
- Describe what would be necessary to produce a "test-tube baby" from conception through the ability to survive on its own.
- Explore the "ectopic pregnancy." How is this event related to the anatomy and physiology of the female reproductive system?

OPTIONAL ACTIVITY

| O | J | T | M | P | O | S | T | U | S | Y | E | S | R | C | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | O | I | T | R | E | M | B | R | Y | O | T | A | H | R | N |
| R | S | O | M | E | D | D | O | E | V | A | A | Q | J | X | E |
| F | C | U | T | P | U | S | L | U | M | E | R | S | L | P | N |
| Q | O | P | R | A | L | I | L | S | O | N | G | R | A | A | P |
| D | O | L | I | E | T | A | T | N | E | P | O | I | C | L | E |
| W | D | A | L | H | T | U | N | E | S | L | O | E | T | I | C |
| R | E | S | A | I | A | U | L | T | I | V | G | X | A | Y | S |
| S | U | C | O | Z | C | Y | G | O | A | R | N | E | T | T | E |
| A | T | N | E | C | A | L | P | G | D | T | E | S | I | R | T |
| O | A | T | P | R | L | E | E | Y | O | E | I | S | O | E | L |
| E | F | E | R | T | I | L | I | Z | A | T | I | O | N | B | E |
| T | P | L | G | E | E | P | O | G | L | C | N | Y | N | U | S |
| U | S | A | H | L | S | E | T | O | A | H | P | Y | S | P | M |
| E | R | Q | U | C | O | N | C | E | P | T | I | O | N | T | E |
| D | R | A | D | M | N | G | R | S | A | E | T | N | E | M | O |

Find the following terms in this maze by circling the words. They may appear frontwards or backwards, vertically, horizontally, or diagonally.

| | | |
|---|---|---|
| ova | uterus | conception |
| fertilization | lactation | implantation |
| zygote | puberty | embryo |
| ovulation | follicle | placenta |

## GLOSSARY

areola: the dark, pigmented portion of the mammary gland which surrounds the nipple.

Bartholin's glands: two small mucous glands located on either side of the vaginal opening.

blastocyst: a fertilized cell which has begun growing and dividing.

breasts: mammary glands.

cervix: neck of the uterus; a portion protrudes into the vagina.

cilia: hair-like structures lining the uterine tubes.

clitoris: erectile tissue of the female genitalia, similar to the penis of the male.

conception: union of the male sperm with the ovum of the female; fertilization.

copulation: sexual intercourse.

corpus luteum: small, yellow body of cells which develops from a ruptured ovarian follicle.

ejaculation: forcible expulsion of seminal fluid from the penis.

embryo: early stage of prenatal development, between the ovum and fetus.

endometrium: mucous membrane lining of the uterus, where implantation of the blastocyst occurs.

estrogen: female hormone, responsible for the development of the secondary sex characteristics and cyclic changes in the menstrual cycle.

external genitalia: external reproductive organs.

fallopian tubes: uterine tubes or oviducts.

female gonads: primary female sex organs; ovaries.

fertilization: union of a mature ovum with a sperm cell, usually occurring in the uterine tube.

| | |
|---|---|
| fimbria (pl. fimbriae): | long, finger-like structures which extend from the openings of the uterine tubes. |
| follicle stage: | a stage of the menstrual cycle when follicles are growing and developing. |
| follicle-stimulating hormone (FSH): | pituitary hormone, stimulates the development of ovarian follicles. |
| fundus: | the upper section of the uterus. |
| graafian follicles: | mature ovarian follicles. |
| greater vestibular glands: (Bartholin's glands) | two small mucous glands located on either side of the vaginal opening. |
| hymen: | fold of mucous membrane which partially covers the entrance of the vagina. |
| implantation: | embedding of a developing blastocyst into the endometrial lining of the uterus. |
| labia majora: | fatty folds of tissue (lips) lying on either side of the vaginal opening. |
| labia minora: | two thin folds of tissue (lips) lying within the labia majora. |
| lactation: | the production and secretion of milk from the mammary glands. |
| mammary glands: | two female reproductive accessory organs which produce and secrete milk; breasts. |
| menarche: | beginning of the menses, first menstrual cycle. |
| menopause: | cessation of menstrual cycle. |
| menses: | monthly flow of bloody fluid and uterine mucous lining. |
| menstrual cycle: | cyclic changes occurring in the uterus, ovaries and vagina. |
| menstruation: | periodic discharge of bloody fluid from the uterus (menses), occurs from puberty to menopause. |
| mons pubis: | uppermost structure of the vulva, mound of fatty tissue lying over the pubic bone. |

| | |
|---|---|
| myometrium: | middle, thickest layer of the uterine wall. |
| nipples: | projections from the breasts from which milk is ejected. |
| oogenesis: | formation and development of the ovum. |
| ovarian follicles: | structures consisting of an ovum and surrounding epithelial cells. |
| ovaries: | the two primary reproductive organs of the female; produce ova and hormones. |
| oviducts: | fallopian tubes or uterine tubes. |
| ovulation: | periodic development and rupturing of a mature graafian follicle from the ovary which releases the ovum. |
| ovulation stage: | stage of the menstrual cycle when the ovum is released from the follicle. |
| ovum (pl. ova): | female reproductive egg cell. |
| perimetrium: | outside layer of the uterine wall. |
| perineum: | external region between the vulva and anus in the female. |
| placenta: | structure which develops in the uterus during pregnancy; nourishes the fetus. |
| progesterone: | hormone, responsible for changes in the uterine endometrium; development of maternal placenta and mammary glands. |
| puberty: | time period when an individual becomes physically capable of reproduction. |
| seminal fluid: | semen, fluid produced by the male reproductive system; contains male reproductive cells. |
| sperm cell: | male spermatozoon; reproductive cell. |
| umbilical cord: | structure connecting the fetus with the placenta. |
| uterine tubes: (fallopian tubes, oviducts) | two small tubes attached to either side of the uterus; transport ova from ovaries to the uterus; normal site of fertilization. |
| uterus: | muscular pear-shaped organ, contains and nourishes embryo and fetus from time of implantation to birth, undergoes periodic changes during menstrual cycle. |

vagina: tube-like passageway which receives the penis during intercourse, discharges menstrual flow, and through which a fetus is delivered.

vulva: female external genitalia, consists of labia majora and minora, clitoris, and vestibule of the vagina.

zygote: cell produced by the union of two gametes, fertilized ovum.

The Reproductive System
POST-TEST

1. Which of the following is the primary function of the reproductive system?

   A. synthesis of hormones
   B. perpetuation of the species
   C. maintenance of homeostasis
   D. production of enzymes

2. The main function of the male in the reproductive process is to:

   A. provide the sperm cell.
   B. nourish the ovum.
   C. protect the developing fetus.
   D. initiate ovulation.

3. Most of the female reproductive organs are located within the:

   A. uterus.
   B. abdomen.
   C. ovaries.
   D. chest.

4. The primary female reproductive organs, or gonads, are the:

   _____.

5. Which male reproductive organs are located external to the body?

   _____

   _____

6. The reproductive cell (egg cell) produced by the female is called the:

_____

7. The pear-shaped organ of the female reproductive system is the:

A. uterine tube.
B. vagina.
C. uterus.
D. cervix.

8. The process of forming mature ova is known as:

A. menstruation.
B. ovulation.
C. reproduction.
D. oogenesis.

9. List the three major functions of the ovaries.

_____

_____

_____

10. Name the three structural divisions of the uterus.

_____

_____

_____

11. What are the female reproductive organs that transport the ova to the uterus?

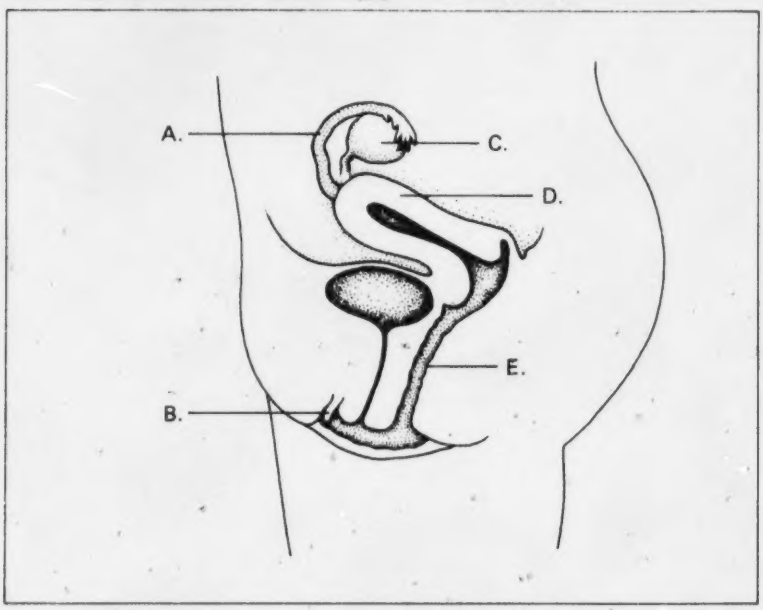
_____

12. Name the two female hormones that are primarily responsible for the changes of puberty.

_____

_____

13.




Match the letter of each organ above to the name of the organ below.

uterus ____
ovary ____
uterine tube ____
vagina ____
clitoris ____

14. List the three layers of the uterine wall.

_____

_____

_____

15. Which organs of the female reproductive system produce and store milk?

_____

16. Which is NOT part of the female external genitalia?

A. clitoris
B. mons pubis
C. cervix
D. labia majora

17. The process by which the female reproductive system secretes milk is called:

_____.

18. A female's first menstrual cycle is called:

A. ovulation.
B. menopause.
C. conception.
D. menarche.

19. The years in which a woman menstruates signifies the years she is able to:

A. conceive children.
B. create ova.
C. produce hormones.
D. undergo puberty.

20. A typical menstrual cycle occurs over a period of about how many days?

A. 10
B. 14
C. 28
D. 36

21. The female menstrual cycle is controlled primarily by:

A. hormones.
B. enzymes.
C. lipids.
D. electrolytes.

22. Name the four stages of the menstrual cycle.

_____

_____

_____

_____

23. In what process is a mature ovum released from a ruptured ovarian follicle?

_____

24. The corpus luteum is formed from cells from the:

A. uterus.
B. follicle.
C. placenta.
D. endometrium.

25. Fertilization is the result of combining a male sperm cell with a female:

_____.

26. Sperm from the male is propelled into the vagina through the act of:

A. menstruation.
B. fertilization.
C. implantation.
D. copulation.

27. Fertilization normally occurs in what organ?

_____

28. When a fertilized cell begins to grow and divide, it is called a:

A. blastocyst.
B. follicle.
C. placenta.
D. spermatozoan.

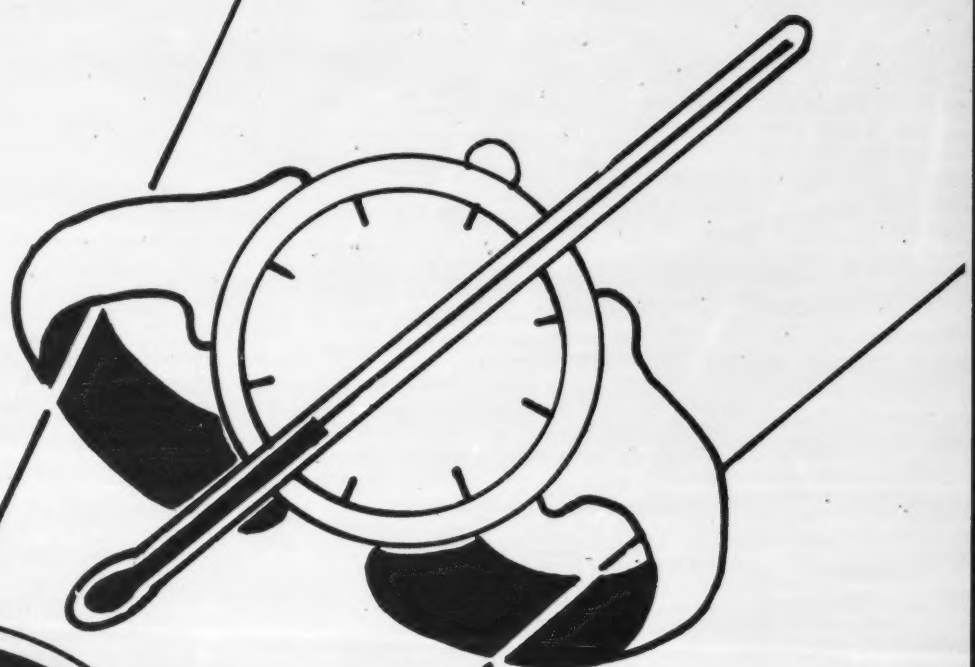
29. The fetus grows and develops inside what female reproductive organ?

_____

30. The structure through which the developing fetus receives nourishment from the mother is the:

A. uterine tube.
B. vagina.
C. umbilical cord.
D. cervix.

# HEALTH OCCUPATIONS EDUCATION MODULE



## INSTRUCTOR'S GUIDE: THE REPRODUCTIVE SYSTEM

Instructional Materials in Anatomy and Physiology
for Pennsylvania Health Occupations Programs

# INSTRUCTOR'S GUIDE:

# THE REPRODUCTIVE SYSTEM

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## INTRODUCTION

These instructional modular units have been developed for the Pennsylvania Department of Education for use in vocational education programs. They were designed on the assumption that a basic understanding of human anatomy and physiology is essential to any person preparing to enter a health care occupation such as practical nursing, nursing assistant, medical assistant, emergency medical technician, or dental assistant. Each of these modular units will cover the most important aspects of one of the major systems of the human body. In the first four units the following systems are covered: circulatory system, respiratory system, musculoskeletal system, and digestive system. In the second four units, the endocrine, reproductive, nervous, and genitourinary systems are covered.

This Instructor's Guide is designed to provide suggestions on how to use a modular unit most effectively in your instruction. These recommendations, however, do not represent the only way to use these units: you may be able to devise more beneficial uses for the materials.

## THE MODULAR UNITS

Each modular unit is made up of several components: a pretest, three to six instructional modules with optional activities for the students, a glossary of terms used in the unit, and a post-test. Each of these components has a specific purpose and is organized in a specific way, as explained in the following sections.

### Pretest

After reading the preface, which is simply an introduction to these instructional units, students working through a modular unit should first take the pretest. Their answers should be written on a separate piece of paper labeled "Pretest" (they should not have access to these answers when taking the post-test). As its name

implies, this test is designed to be taken by the student before beginning work on the materials contained in the unit. Its purpose is twofold: (1) to stimulate interest in the modular unit by giving the student a preview of the topics covered, and (2) to provide information to the instructor on what students do and do not know, before and after working through the unit. Based on the student's performance on the pretest, the instructor may wish to emphasize those areas of the modular unit which may require special attention and extra effort on the part of the students. Instructors should score the pretests after the students have completed them, but should not share these scores with the students. After completing the unit, students will then take the post-test (which involves all of the questions on the pretest, and more). Instructors may then compare post-test scores to pretest scores in order to evaluate the amount that students have learned from the unit.

## Instructional Modules

This modular unit is composed of four separate but closely related modules, including: Introduction to the Reproductive System, The Female Reproductive Organs, The Menstrual Cycle, and Conception. After taking the pretest, students should read through and study each of the instructional modules. For the students' benefit, each module begins with a statement of the objectives that a student should have mastered upon completion of that particular module. The level of achievement of these goals is measured by students' performance on the corresponding section of the final post-test. The language level and content of each module is aimed toward students seeking an introduction to the components, structures and functions, and the basic terminology required for an understanding of the reproductive system. However, some material may be too technical or otherwise inappropriate for certain programs. Instructors are urged to use their judgment to determine if any areas are too difficult and should be omitted.

## Optional Activities

Following many modules are optional activities intended to provide the student with an opportunity to pursue the content of the module at a more in-depth level. Many of these activities may require teacher participation, at least in obtaining and preparing additional materials for students to utilize.

In addition to the optional activities available, you may choose to provide further information to the students by teaching a brief unit on the common disorders of the reproductive system. Discussion of these disorders has not been included in

the text because a basic knowledge of the proper structure and function of the human body in a healthy individual seems more appropriate for the purposes of an introductory program. If you do choose to discuss common disorders, the most effective approach may be one in which you use disorders to illustrate what can go wrong in the body, as a means of clarifying the students' understanding of how the body works when functioning properly.

You may also wish to provide students with the names of books or articles as suggested readings to further their understanding of a particular area.

## Glossary

After the last of the modules in the unit is a glossary. This is not intended to be a comprehensive glossary to be used by students as a dictionary. Rather, it includes the basic terms used in the unit which are necessary to an understanding of the system covered. Those underlined words which appear in the modules and have been defined in the text are not always defined in the glossary. Some of these particular terms have been used in the module because they are essential but difficult terms needed to explain the content taught in the unit. Students should use the glossary to review the vocabulary essential to the unit before taking the post-test.

## Post-Tests

The post-test is the final assessment of a student's understanding of the material presented in each module. It consists of multiple-choice and open-ended questions designed to measure a student's mastery of the objectives stated at the beginning of each module. Each of the questions has been written to measure an aspect of the skills and/or knowledge that a student may be expected to acquire as a result of working through a particular unit. The post-test includes the questions used in the pretest, which can be used for before-and-after comparisons; and it includes additional difficult questions which measure knowledge of subjects treated specifically in the modules.

## SCORING THE POST-TESTS

As previously mentioned, the purpose of the post-tests is to measure whether or not a student has mastered the objectives stated at the beginning of each module. Due to the variety of ways in which teachers may choose to utilize these modules, and discrepancies among students' previous exposure to the subject matter, it is not practical to set a standard cut-off score on the post-test that would indicate mastery of the objectives. Rather, teachers are asked to use their professional judgment in individual cases to determine if a student's performance on the post-test indicates that he or she has mastered the objectives stated for the modules. In making this determination, you should consider at least all of the following factors:

(1) How long is the post-test?

(2) How much information is included in each module and how complex is the information, relative to other modules?

(3) Has the student been exposed to the kind of curricular material before? That is, has the student been taught the basics of this system of the body before?

(4) Should the entire class be required to achieve a certain score in order to pass, or should each student be considered individually? (This depends on how and with whom you use this module as instructional material.)

(5) Should the student be graded pass/fail on mastery of objectives in each module, or on the unit as a whole?

To facilitate the scoring of the post-test, each student will record his or her answers on one separate sheet of paper. You should first mark each answer correct or incorrect. Then give the student a "pass" or "fail" on each module by counting the questions answered correctly, or score the unit as a whole by adding up all of the correct answers.

Because of the subject matter, responses to open-ended questions may vary slightly from those provided, but these responses may also be acceptable. Again, in these cases instructors are asked to use their professional judgment to determine if a response is correct.

In order to compare the students' scores on the pretest and post-test; review the scores each student achieved on the pretest, then total the score students achieve on these same questions appearing in the post-test. (Please note: these questions have been placed in different sequence and renumbered; both their old and new numbers are listed in the answer key.) You may wish to compare the students' scores on the entire set of items which appears in both tests, or on the items for each module, or on each item individually. Whichever approach seems most useful can be accomplished by using the information given.

On the following page is a list of answers to the pretest and post-test questions, which is provided to facilitate the grading of your students' papers.

## ANSWER KEYS

### Pretest

| | | | | | |
|---|---|---|---|---|---|
| 1. | ovaries | 6. | D | 11. | perimetrium, myometrium, endometrium |
| 2. | B | 7. | ovum | 12. | A |
| 3. | C | 8. | C | 13. | uterine tube |
| 4. | ovulation | 9. | A | 14. | estrogen, progesterone |
| 5. | mammary glands | 10. | fundus, body, cervix | 15. | B |

### Post-test

NOTE: Starred question numbers indicate those questions which also appeared on the pretest. The pretest number of each repeated question is given in parentheses. Post-test questions 1-2 and 5-6 refer to materials presented in module 1, Introduction to the Reproductive System; questions 3-4 and 7-17 refer to module 2, The Female Reproductive Organs; questions 18-24 refer to module 3, The Menstrual Cycle; and questions 25-30 refer to module 4, Conception.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| * 1. | (2) | B | 11. | | uterine tubes | *21. | (9) | A |
| 2. | | A | *12. | (14) | estrogen, progesterone | 22. | | follicle, ovulation, corpus luteum, menstruation |
| * 3. | (15) | B | 13. | | D, C, A, F, B | *23. | (4) | ovulation |
| * 4. | (1) | ovaries | *14. | (11) | perimetrium, myometrium, endometrium | 24. | | B |
| 5. | | penis, testes | *15. | | mammary glands | *25. | (7) | ovum |
| 6. | | ovum | 16. | | C | 26. | | D |
| * 7. | (3) | C | 17. | | lactation | *27. | (13) | uterine tube |
| 8. | | D | *18. | (6) | D | 28. | | A |
| 9. | | oogenesis, ovulation, hormone secretion | *19. | (12) | A | 29. | | uterus |
| *10. | (10) | fundus, body, cervix | 20. | | C | *30. | (8) | C |